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BEFORE THE BOARD OF PATENT APPEALS

AND INTERFERENCES

Paper No. 19

Application Number: 09/394189

Filing Date: 9/13/1999

Appellant(s): Paul A. Underbrink

Christopher J. Rourk

For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 2/10/2003.

(1) Real Party in Interest

A statement identifying the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) Status of Claims

The statement of the status of the claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Invention

The summary of invention contained in the brief is correct.

(6) Issues

The appellant's statement of the issues in the brief is correct.

(7) Grouping of Claims

Appellant's brief includes a statement that claims 1-6, 8-12, 22-28, 30 and 31 stand or fall together and provides reasons as set forth in 37 CFR 1.192(c)(7) and (c)(8).

(8) Claims Appealed

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) Prior Art of Record

The following is a listing of the prior art of record relied upon in the rejection of claims under appeal.

Erturk et al, "Design/Analysis of an Active Integrated Antenna." IEEE, 0-7803-3216-4/96 pp 1322-1325

5,542,106	Krenz et a	7-1996
5,530,919	TSURU et al	6-1996
5,400,040	LANE et al	3-1996
6,134,420	FLOWERDEW et al	10-2004
4,849,767	NAITOU	7-1989

(10) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless -
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claim 27 is rejected under 35 U.S.C. 102(b) as being anticipated by Erturk, IEEE #0-7803-3216.

Regarding claim 27,

Erturk discloses a method for wireless communication, comprising

providing a patch antenna (FIG 1), and performing a finite-element analysis on the design of the size (given the notch, page 1 lines 25-29) and match the input impedance of said antenna with a transmission line (page 1 lines 26-29) so as to optimize the impedance (page 1 line 29-page 2 line 19) for use with the rest of the wireless device (page 1 lines 1-3), which comprises an active element (a transistor) connected to the antenna via a transmission line (page 1 lines 15-17, FIG 1). The examiner reads the transistor and the transmission line as comprising a transmitter amplifier portion of the invention, and further adds that said analysis inherently comprising steps of determining the transmitter impedance as well as the estimated impedance of the antenna, given that the impedance is to be optimized via the design of the notch,

optimizing the area of the antenna (i.e. adjusting the notch, page 1 lines 25-29) to match the impedance, and

providing the patch antenna for use in wireless communications, inherently via a device.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-4, 6, 8, 9, 11, 12, 22-26 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuru in view of Krenz, Lane and Erturk.

Regarding claim 1,

Tsuru discloses a hand-held communications device (1),

an antenna (3) coupled to the device (col 3 lines 32-56), the antenna configured so as to radiate with greater field intensity over an area of less than 360 degrees of arc (col 3 line 57-col 4 line 20, see FIG 11),

wherein the portion of the field that is of greater intensity is in the direction away from the head of the user of the device (col 1 lines 52-59, col 2 lines 13-24).

Tsuru does not specifically disclose a transmitter amplifier, however, such would be inherent in a handheld wireless device which radiates data via an antenna. Tsuru further fails to disclose that the transmitter and antenna impedances are matched, and that the matching is determined by a finite element analysis and adjustment of the antenna impedance.

Krenz discloses the utility of matching the impedance of an antenna to a transceiver (col 1 lines 37-39, col 2 lines 44-51).

Lane discloses that a patch antenna's impedance is based on its surface area (col 3 lines 37-51).

Erturk discloses providing a patch antenna (FIG 1) for a wireless device, and performing a finite-element analysis on the design of the size (given the notch, page 1 lines 25-29) and match the input impedance of said antenna with a transmission line (page 1 lines 26-29) so as to optimize the impedance (page 1 line 29-page 2 line 19) for use with the rest of the wireless device (page 1 lines 1-3), which comprises an active element (a transistor) connected to the antenna via a transmission line (page 1 lines 15-17, FIG 1). The examiner reads the transistor and the transmission line as comprising a transmitter amplifier portion of the invention, and further adds that said analysis inherently comprising steps of determining the transmitter impedance as well as the estimated impedance of the antenna, given that the impedance is to be optimized via the design of the notch, and optimizing the area of the antenna (i.e. adjusting the notch, page 1 lines 25-29) to match the impedance.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to add such a feature to Tsuru, as matching the impedance of the transmitter portion and antenna provides for more efficient operation and sensitivity. Further, by analyzing the surface area of the antenna, the impedance may be modeled, as suggested by Erturk and Lane; thus, one of ordinary skill in the art would have no doubt been motivated to analyze the area of the patch antenna (finite element analysis) to determine the antenna's impedance, thus notifying him or her how much the antenna may be adjusted in order to match the impedance to the transceiver.

Regarding claim 2,

since Tsuru teaches a radiotelephone, which typically operates on a single channel, or narrow band, it is inherent that a signal radiated from the device would be within a narrow and predetermined band.

Regarding claim 3 and 4,

Krenz further discloses that it is useful to provide a loop antenna or a patch antenna (col 2 lines 35-39).

Regarding claim 6,

Tsuru further discloses that it is useful to couple a receive antenna (col 5 lines 51-55) to the hand-held device.

Regarding claim 8,

Tsuru discloses a hand-held wireless cellular communications device (1), and

a transmit antenna (33) and a receive antenna (34) coupled to the device (col 2 lines 3-12 and col 5 lines 25-55).

Tsuru does not specifically disclose a transmitter amplifier, however, such would be inherent in a handheld wireless device which radiates data via an antenna. Tsuru further fails to disclose that the transmitter and antenna impedances are matched, and that the matching is determined by a finite element analysis and adjustment of the antenna impedance.

Krenz discloses the utility of matching the impedance of an antenna to a transceiver (col 1 lines 37-39, col 2 lines 44-51).

Lane discloses that a patch antenna's impedance is based on its surface area (col 3 lines 37-51).

Erturk discloses providing a patch antenna (FIG 1) for a wireless device, and performing a finite-element analysis on the design of the size (given the notch, page 1 lines 25-29) and match the input

impedance of said antenna with a transmission line (page 1 lines 26-29) so as to optimize the impedance (page 1 line 29-page 2 line 19) for use with the rest of the wireless device (page 1 lines 1-3), which comprises an active element (a transistor) connected to the antenna via a transmission line (page 1 lines 15-17, FIG 1). The examiner reads the transistor and the transmission line as comprising a transmitter amplifier portion of the invention, and further adds that said analysis inherently comprising steps of determining the transmitter impedance as well as the estimated impedance of the antenna, given that the impedance is to be optimized via the design of the notch, and optimizing the area of the antenna (i.e. adjusting the notch, page 1 lines 25-29) to match the impedance.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to add such a feature to Tsuru, as matching the impedance of the transmitter portion and antenna provides for more efficient operation and sensitivity. Further, by analyzing the surface area of the antenna, the impedance may be modeled, as suggested by Erturk and Lane; thus, one of ordinary skill in the art would have no doubt been motivated to analyze the area of the patch antenna (finite element analysis) to determine the antenna's impedance, thus notifying him or her how much the antenna may be adjusted in order to match the impedance to the transceiver.

Regarding claim 9,

Krenz discloses a cellular phone (col 1 line 65-col 2 line 13).

Regarding claim 11,

Krenz further discloses that it is useful in a hand-held communication device (100) with an antenna (105), to provide a patch antenna (col 2 lines 35-39), which would be contained within the housing of the unit.

Regarding claim 12,

while Krenz discloses a patch antenna, it is not disclosed that the patch antenna may be contained within an IC package, it was well known in that art at the time of the invention to integrate a patch antenna into an IC, as shown by the teachings of Filimon, where it is stated that a patch antenna may comprise a piece of copper foil mounted to the inside of the device, and that the patch antenna may be a conductive coating applied directly to a panel (col 3 line 64-col 4 line 2 and lines 43-47). As such, the examiner takes Official Notice of such a feature, as the need to reduce the size and complexity of the circuit would obviously motivate one of ordinary skill in the art to enclose such antennae in an IC package, especially given the suggestion of a conductive coating, as an IC package would reduce production costs by eliminating extra components.

Regarding claim 22,

Tsuru discloses a method for use in a hand-held communications device (1), comprising

modulating speech data onto a signal,

transmitting the signal from an antenna (3) coupled to the device (col 3 lines 32-56), the antenna configured so as to radiate with greater field intensity over an area of less than 360 degrees of arc (col 3 line 57-col 4 line 20, see FIG 11),

wherein the portion of the field that is of greater intensity is in the direction away from the head of the user of the device (col 1 lines 52-59, col 2 lines 13-24).

Tsuru does not specifically disclose a transmitter amplifier, however, such would be inherent in a handheld wireless device which radiates data via an antenna. Tsuru further fails to disclose that the

transmitter and antenna impedances are matched, and that the matching is determined by a finite element analysis and adjustment of the antenna impedance.

Krenz discloses the utility of matching the impedance of an antenna to a transceiver (col 1 lines 37-39, col 2 lines 44-51).

Lane discloses that a patch antenna's impedance is based on its surface area (col 3 lines 37-51).

Erturk discloses providing a patch antenna (FIG 1) for a wireless device, and performing a finite-element analysis on the design of the size (given the notch, page 1 lines 25-29) and match the input impedance of said antenna with a transmission line (page 1 lines 26-29) so as to optimize the impedance (page 1 line 29-page 2 line 19) for use with the rest of the wireless device (page 1 lines 1-3), which comprises an active element (a transistor) connected to the antenna via a transmission line (page 1 lines 15-17, FIG 1). The examiner reads the transistor and the transmission line as comprising a transmitter amplifier portion of the invention, and further adds that said analysis inherently comprising steps of determining the transmitter impedance as well as the estimated impedance of the antenna, given that the impedance is to be optimized via the design of the notch, and optimizing the area of the antenna (i.e. adjusting the notch, page 1 lines 25-29) to match the impedance.

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to add such a feature to Tsuru, as matching the impedance of the transmitter portion and antenna provides for more efficient operation and sensitivity. Further, by analyzing the surface area of the antenna, the impedance may be modeled, as suggested by Erturk and Lane; thus, one of ordinary skill in the art would have no doubt been motivated to analyze the area of the patch antenna (finite element analysis) to

determine the antenna's impedance, thus notifying him or her how much the antenna may be adjusted in order to match the impedance to the transceiver.

Regarding claim 23,

Tsuru discloses receiving an incoming signal at a second antenna (34, col 5 lines 43-55).

Regarding claim 24,

Krenz further discloses that it is useful in a hand-held communication device (100) with an antenna (105), to provide a patch antenna (col 3 lines 35-39), which would be contained within the housing of the unit.

Regarding claim 25,

Tsuru further discloses receiving signals with a monopole antenna (col 1 lines 16-25).

Regarding claim 26,

Tsuru further teaches a monopole antenna for receiving signals (col 5 lines 43-55).

Regarding claim 31,

given that Tsuru in view of Krenz, Lane and Erturk disclose a cellular telephone, inherently communicating via at least two base stations, the orientation of the portable device would vary during its use; that is to say, a situation in which the device was communicating with one base station while facing one direction, and then later with another base station while pointed arbitrarily in another direction, would have been realized by one of ordinary skill in the art as naturally occurring in an invention such as the combined invention of Tsuru in view of Krenz, Lane and Erturk, given that the claim language does not state that the phone would pick a base station to communicate with based on its orientation, or that it would only communicate with one station or the other based on its orientation.

5. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuru in view of Krenz, Lane and Erturk as applied to claim 1 above, and further in view of Flowerdew et al.

Tsuru in view of Krenz, Lane and Erturk discloses applicant's invention of claim 1, and further states that it is useful to couple a receive antenna (col 5 lines 51-55) to the hand-held device. Tsuru does not disclose that the receive antenna has a filed of reception orthogonal to the field of reception of the transmit antenna.

Flowerdew discloses that it is useful in a hand-held device (104) comprising a transmit antenna (904) and a receive antenna (902) to provide the two antennas with mutually orthogonal fields of transmission/reception (col 8 lines 25-61).

Therefore, it would have been obvious to one skilled in the art to add such a function to Tsuru in view of Krenz, Lane and Erturk, since Flowerdew states that orthogonal fields minimize mutual coupling (col 13 lines 36-48), which is advantageous.

6. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tsuru and Krenz, Lane and Erturk as applied to claim 8 above, and further in view of Flowerdew.

Tsuru in view of Krenz, Lane and Erturk discloses applicant's invention of claim 8, but does not disclose that the receive antenna has a filed of reception orthogonal to the field of reception of the transmit antenna.

Flowerdew discloses that it is useful in a hand-held device (104) comprising a transmit antenna (904) and a receive antenna (902) to provide the two antennas with mutually orthogonal fields of transmission/reception (col 8 lines 25-61).

Therefore, it would have been obvious to one skilled in the art to add such a function to Tsuru and Krenz, Lane and Erturk, since Flowerdew states that orthogonal fields minimize mutual coupling (col 13 lines 36-48).

7. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Erturk.

As shown above, Erturk discloses applicant's invention of claim 27. While not disclosing that the amplifier system's impedance is specifically 10 ohms, it would have been obvious to one of ordinary skill in the art at the time of the invention that transmitter amplifiers with such characteristic impedances were available, and as such, such a value would have been the product of a routine engineering decision, that is, the choice of transmitter amplifier used in a particular embodiment of the invention.

8. Claim 30 is rejected under 35 U.S.C. 103(a) as being unpatentable over Erturk as applied to claim 27 above, and further in view of Naitou.

While disclosing applicant's invention of claim 27 above, Erturk does not disclose that the adjustment may be operable to change the antenna pass band.

Naitou suggests that antennas may be adjusted so as to tune to a particular channel, i.e. change the passband characteristic of the antenna (col 1 lines 15-21), thus reducing the need for further filtering.

Given such a suggestion, it would have been obvious to one of ordinary skill in the art at the time of the invention to add such a feature to Erturk, who teaches the utility of adjusting a patch antenna, while Naitou suggests adjustment of antenna passbands is preferable, and as such, adding such a feature to Erturk would provide better response and sensitivity.

(11) Response to Argument

First, appellant states that none of the prior art of record discloses the step of determining the impedance of an antenna using a finite element analysis on the design of the antenna. However, the examiner asserts that such is taught by *Erturk*. *Erturk* states that a patch antenna design is adjusted based on the surface area by the adjustment of a notch. Notched antennas such as that taught by *Erturk* have an impedance and various radiation characteristics (such as a radiation pattern) which are determined by the size of said notch and its size relative to the rest of the antenna. *Erturk* explains that "By introducing a notch, whose width is optimized with a modified transmission line model, the input impedance of the antenna at resonance is matched to the characteristic impedance of the microstrip line". In the case of the rejection above, the microstrip line is a portion of the transmitter amplifier portion of the circuit as read by the examiner. Since the antenna is matched to the output of said line, its input impedance is thus matched to the output impedance of the transmitter amplifier portion. *Erturk* further states that "the passive components, whose time and frequency domain characteristics including mutual coupling, are obtained with a FTDT algorithm, are modeled as a 4-port network and represented by the corresponding scattering matrix". This is read by the examiner as follows: first, the passive components include the antenna, as well as the microstrip line of the transmitter portion. Second, said components have time and frequency domain characteristics, such as frequency response and inherent impedance (an S-domain, or frequency domain characteristic). Said characteristics include mutual coupling, i.e. impedance. Third, said characteristics are modeled with said FTDT protocol, which is read as a finite element analysis. Thus, a finite element analysis is utilized to determine the expected impedance of the notched antenna based on the design and

the notch data. The impedance must be matched, which would include the inherent step of determining the output impedance of the transmitter portion, else there would be nothing to match the antenna impedance to. Given that the antenna notch design is 'optimized' to match the transmitter portion in design, such includes, of course, the adjustment of the design to match the impedance properly.

Second, appellant states that *Erturk* fails to disclose using the finite element analysis to determine impedance, but rather radiation patterns of the antenna. However, as demonstrated above, the analysis is utilized to determine frequency domain and coupling characteristics for adjusting the passive components. The appellant quotes *Erturk* starting with page 1, as quoted above, relating to the optimization of the notch width, and jumps directly to page 2, where the radiation pattern is determined. However, the appellant fails to note the sentence directly after that disclosing the notch adjustment, which states "the passive components, whose time and frequency domain characteristics including mutual coupling are obtained with a FTDT algorithm, are modeled as a 4-port network and represented by the corresponding scattering matrix". Since the appellant apparently considers the FTDT algorithm to be the finite-element analysis of the claimed invention, such analysis would then have to be applied to more than just the radiation pattern, but rather to the 'time and frequency domain characteristics including mutual coupling'. The appellant further states that *Erturk* only teaches an adjustment of the microstrip line, however, such may not be read from *Erturk*, as the antenna is the passive device which is notched, as shown in FIG 1.

Third, appellant asserts that the impedance optimization of *Erturk* is not to match the antenna to a transmitter, since the notch is for the transmission line only. The examiner reiterates that stated above, referencing the notch being a portion of the antenna. Further, since, as stated above, the examiner reads the line as a part of the transmitter portion of the invention of *Erturk*, the matching of the antenna

impedance to the line is matching the antenna to the transmitter portion. While it is true that in *Erturk*, the radiation pattern is of primary importance, it does not matter which is of primary or secondary importance in a reference, nor whether the portion being relied upon is a preferred or secondary embodiment, as long as the claimed invention is disclosed by said reference.

Lastly, regarding the dependent claims, the appellant refers to the same arguments regarding *Erturk* as above, and as such the examiner refers to the rejection and arguments above as well.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Charles R. Craver

4-29-03

CHARLES CRAVER
PATENT EXAMINER

cc

April 29, 2003

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